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ABSTRACT

Since imagery is a unidimensional variable, all measures of imagery, both questionnaires and behavioral, should be correlated; this, however, has not been supported by earlier research. Therefore, a new questionnaire on mental imagery--the Differential Imagery Questionnaire (DIQ)--was developed which taps four types of imagery: word imagery (WI); picture memory (PM); imagery manipulation (IM); and fantasy (F). The questionnaire was then validated against four behavioral measures of imagery. With one exception (WI), the questionnaire subsections significantly correlated with the respective behavioral measures. This finding suggests that self-reports of imagery clarity (questionnaires) may indeed be used to predict other specific behaviors. At this point, there remains a need for further development of the DIQ. Although statistically significant relationships were found between the factors and the behavioral tasks, the relationship was relatively low in terms of percent of common variance. (A copy of the DIQ is included.) (Author/RD)

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The Relationship between the Differential Imagery Questionnaire and Four Behavioral Tasks

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Abstract

A number of earlier researchers have had difficulty relating questionnaire measures of imagery with behavioral assessments of imagery. One of the assumptions underlying these questionnaires has been that imagery is a unidimensional variable. If this is so, then all measures of imagery, both questionnaires and behavioral, should correlate, at least to some degree. This has not been supported by the data. Therefore, a new questionnaire on mental imagery was developed which taps four types of imagery: word imagery (WI); picture memory (PM); imagery manipulation (IM); and fantasy (F). The questionnaire was then validated against four behavioral measures of imagery. With one exception (WI), the questionnaire subsections significantly correlated with the respective behavioral measures. This finding suggests that self-reports of image clarity (questionnaires) may indeed be used to predict other specific behaviors. At this point, there remains a need for further development of the DIQ. Although statistically significant relationships were found between the factors and the behavioral tasks, the relationship remains relatively low in terms of percent of common variance (approximately 5 to 8%).

The Relationship between the Differential Imagery Questionnaire and Four Behavioral Tasks

A number of earlier researchers have had difficulty relating questionnaire measures of imagery with behavioral assessment of imagery (Di Vesta, Ingersoll and Sunshine, 1971; Sheehan, 1971; Sheehan and Neisser, 1969). One of the assumptions underlying these questionnaires has been that imagery is a unidimensional variable. If this is so, then all measures of imagery, both questionnaires and behavioral, should correlate, at least to some degree. This has not been consistently supported by the data (Danaher and Thoresen, 1972; Hiscock, 1978; White, Sheehan and Ashton, 1977).

On the other hand, if imagery is not unidimensional, perhaps the previous questionnaires were confounded by a lack of internal consistency and a lack of image specificity. For example, is the image evoking property of a word in a PAL task the same thing as the imagery experienced during daydreaming or during a picture memory task. The present series of studies were undertaken to develop a questionnaire that would tap various types of imagery and relate these to various types of behavioral tasks.

One type of imagery that has been investigated rather thoroughly by Paivio and his associates (Paivio, 1971) is word imagery; the image evoking quality of words. In particular, this type of imagery has been related to facilitation of learning on a PAL task and in some cases (Ernest and Paivio, 1971) a relationship has been demonstrated between ratings of image clarity and performance on the PAL task. The imagery ratings were obtained by combining measures from the Minnesota Paper Form Board Test, a Space Relations task and the Individual Differences Questionnaire. The dependent measure in this case, however, was latency to a good image rather than accuracy.

A second type of imagery that has been investigated is picture memory (Marks, 1973). In the typical procedure used in a picture memory experiment, a visual stimulus is presented to the subject for a pre-determined period of time. The stimulus is then removed and the subject is required to engage in some intervening task such as counting. At the end of a specific time the subject is asked to recall certain characteristics about the stimulus. With the exception of Marks (1973), most investigators (Sheehan and Neisser, 1969) have had little success in relating self-reports of image clarity to actual performance on a behavioral task.

A third type of visual imagery involves the manipulation of an object in three-dimensional space. Gordon's (1949) scale of control of imagery was one attempt to tap this particular type of imagery. This scale, however, has been demonstrated to be highly sensitive to social desirability (Di Vesta, Ingersoll and Sunshine, 1971), thus, limiting its usefulness in predicting performance on a behavioral measure.

The fourth type of imagery considered was that involved in fantasy and imagination. While this area has been investigated by Singer and others (Singer and Antrobus, 1972), it has generally been considered somewhat separate from other types of imagery. It was included here because one aspect of fantasy is the juxtaposition of unusual or seemingly unrelated elements and it was believed that this amount of control of one's images represents a rather high level of imaging ability.

Development of the Differential Imagery Questionnaire (DIQ)

In reviewing the previously published scales, it appears that they tap various types of imagery within the same scale. For example, the Vividness of Visual Imagery Questionnaire (VVIQ) developed by Marks (1973) contains both picture memory imagery; "the exact contour of face, head, shoulders and

body (of a friend)" and manipulation of imagery; "the precise carriage, length of step, etc., in walking." Similar confoundings can be identified in the Individual Differences Questionnaires (Paivio, 1971), Sheehan's attenuated Betts' Questionnaire upon Mental Imagery (Sheehan, 1967) and The Visualizer-Verbalizer Questionnaire (Richardson, 1977). Only the Gordon (1949) control of imagery scale seems to tap a single type of imagery.

In an attempt to develop an instrument that would offer greater precision in the assessment of visual imagery, four types of items were selected from existing questionnaires and others were selected intuitively. The types of items correspond to four types of visual imagery: word imagery (WI); picture memory (PMQ); imagery manipulation (IM); and fantasy (F). A total of twenty items were selected, five from each type of imagery. In order to be consistent with earlier research, the format of the items and response mode were similar to published questionnaires (Sheehan, 1967).

The questionnaire was administered to introductory psychology students during their regular class sessions. The data were factor analyzed and items which did not load greater than .3 on any factor or which had a loading of greater than .5 on more than one factor were discarded and replaced by other items. The process was then repeated using a different sample.

Finally, the Differential Imagery Questionnaire (DIQ) was developed, which contained four factors which corresponded to the four types of visual imagery. Table 1 contains the loadings of each questionnaire item on the four factors. The first five items on the questionnaire represent the WI type of imagery and these five items load most heavily on Factor I. The last five questionnaire items represent the F imagery and comprise the second factor. Factors III and IV are weaker factors and roughly represent IM (items 11-15) and PMQ (items 6-10), however, these item clusters are not as clearly defined.

At this point, four behavioral measures of imagery were selected to represent the differing types of imagery. Task one was a paired-associate verbal learning (PAL) task. Two lists of 20 pairs of words were randomly selected from Paivio, Yuille and Madigan (1968) lists. All words had imagery ratings of 6.00 or greater. The dependent measure on this task was the degree of improvement over baseline that the subjects achieved when instructed to utilize a mental imagery learning strategy.

Task two was a picture memory task (PM) similar to one described by Marks (1973). Five montages of 12 unrelated pictures each were created. Slides of the montages were presented to the subjects for twenty seconds each. When the slide was removed, the subjects were told to look at the blank, white screen and project a visual image there of the montage. In order to inhibit verbal rehearsing, the subjects were instructed to count backward by three's from a stimulus number while maintaining their image on the screen. At the end of a twenty second period, the subjects were instructed to rate the clarity of their imagery on a scale from one to seven with one being "no image at all" and seven being "as clear and vivid as the actual picture." Following this rating, the subjects were asked five multiple choice questions about the montage they had just viewed. These questions asked for information about positions of items in the montage. For example: "What is located in the top right corner? a. Hand lotion. b. Windmill. c. Woman." The dependent variables measured on this task were image clarity ratings and number of correct responses to the multiple choice questions.

The third task was the Space Relations (SR) subtest of the Differential Apptitude Test. The items on this test consist of drawings of "flattened" geometric forms for which the subject is asked to indicate which one of four alternative three dimensional forms would result from "folding" the

"flattened" form. The test was administered according to the standard procedure and the dependent measure was the total correct responses.

The final behavioral measure was the Torrance Creativity Test (TCT). Only the Picture Completion and Parallel Lines subsections of the TCT were administered. Total scores were computed for fluency, flexibility, originality and elaboration. Later analysis revealed relatively high correlations between the TCT variables, therefore, for simplicity, the fluency variable was selected to represent the TCT in subsequent analysis.

A total of ninety-two students from introductory psychology classes participated in the final phase of the research. They were assembled in groups of three to six individuals in a small experimental room and the four behavioral tasks were presented to them via tape recorder in counterbalanced order. At the end of the experimental session, the final form of the DIQ was administered and the subjects were debriefed.

Results and Discussion

Correlational analyses of the data indicate that the first two sections of the DIQ, WI and PMQ are correlated ($r=.34$, $p < .01$). In similar fashion, the last two sections, IM and F, also correlated ($r=.34$, $p < .01$).

One conclusion that one could draw from this pattern of data is that there are two types of items on the DIQ instead of four. The first ten items may represent more of a verbal factor, i.e. the image evoking quality of words. The second factor may involve more constructive imagery, i.e. building and manipulating an image rather than passively allowing it to "pop into one's head." These two factors also represent a difficulty gradient with the last ten items being more difficult than the first ten.

While it is usually assumed that one would respond more accurately when one has a clear image of the stimulus, this relationship between function and clarity has been obtained only intermittently by a variety of researchers

(Sheehan, 1972). Again, in the present study, the relationship did not hold up ($r=.18$, $p.) .05$). Apparently, general differences in imaging abilitity can be measured but clarity and function may not be related for any one specific task.

Table 2 describes the relationships between the DIQ subsections and the specific behavioral tasks. In general, the hypothesized relationships between the DIQ variables and the behavioral measures were obtained. Only the WI - PAL relationship failed to reach statistical significance. These findings suggest that the earlier attempts to utilize self-report measures to predict performance on other behavioral tasks were being confounded by lack of specificity of imagery type. The previous questionnaires were too broad in scope.

While the results of the present research are far from being overwhelming, they do suggest directions for future research. For one, future self-report measures of clarity of imagery should contain provisions for measuring different types of imagery. For example, differentiation should be made between measures calling for constructive imagery and measures calling for spontaneous or reactive imagery. A second direction is in terms of the validation of the instrument against other measurable behaviors. Again, the task selected for validation must require the same type of imagery as the self-report measure.

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	FACTOR				
VARIABLE	I	II	III	IV	h^2*
1	.73	.26	.34	.04	.71
2	.86	.12	.15	.26	.85
3	.84	.13	.20	.27	.83
4	.72	.27	.27	.30	.76
5	.75	.07	.06	.40	.74
6	.22	.16	.74	.01	.63
7	.33	.32	.68	.26	.74
8	.18	.14	.67	.35	.62
9	.67	.36	.33	.28	.76
10	.60	.24	.09	.12	.44
11	.62	.32	.23	.46	.75
12	.45	.31	.21	.64	.76
13	.31	.41	.04	.61	.64
14	.31	.28	.16	.74	.75
15	.28	.18	.25	.76	.75
16	.14	.78	.29	.27	.80
17	.18	.84	.21	.14	.81
18	.32	.85	.08	.11	.84
19	.31	.81	.12	.22	.82
20	.10	.85	.16	.31	.86
Eigenvalues*	10.68	2.10	1.06	1.01	

Factor loadings of variables on last revision of the DIQ
N=162

*Some variation may occur due to rounding

Table 1

		Questionnaire Variables				Behavioral Task Variables		
		WI	PMQ	IM	F	PAL	PM	SR
	PMQ	.34						
Questionnaire	IM	.12	.17					
Variables	F	.10	.09	.34				
	PAL	.19	.03	.05	.09			
Behavioral	PM	.09	.23	.09	-.01	.06		
Task	SR	-.07	.00	.28	.15	.05	.33	
Variables	TCT	-.02	-.12	.19	.25	.02	.03	.14

Correlation Matrix of DIQ factors
and Behavioral Task variables
N=92

Table 2

With your eyes open, think of seeing the following, considering carefully the picture which comes before your mind's eye. Indicate the degree of clearness and vividness of your image according to the scale below. Write your rating in the space beside each item.

1. No image present at all, you only 'knowing' that you are thinking of the object.
2. So vague and dim as to be hardly discernible.
3. Vague and dim.
4. Not clear or vivid, but recognizable.
5. Moderately clear and vivid.
6. Very clear and comparable in vividness to the actual experience.
7. Perfectly clear and as vivid as an actual experience.

1._____ A cat

2._____ A building

3._____ A tree

4._____ A bird

5._____ A car

6._____ A pagoda

7._____ A koala bear

8._____ A matador's costume

9._____ A penguin

10._____ A sailing yacht

11._____ The bottom of a table

12._____ The back of a painting

13._____ A view of your car from the top

14._____ The underside of your bed

15._____ The back side of an upright piano

16._____ A fur covered egg

17._____ A green dog

18._____ A book the size of a building

19._____ A house balanced on the point of its roof

20._____ A fish wearing a sweater